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ABSTRACT

A model for estimating the economic value of children is presented in this report designed to assist researchers of the less developed nations in assessing: amount and distribution of children's contribution to national output; the economic benefits of health, nutrition, and schooling changes; the persistence of rural people in having large families; and the failure of many traditional parents to use available schools, nutritious foods, and health care. The model attempts to tie investigation of child value to existing scientific literature; make explicit the conceptually ideal measure of child economic value; provide for separation of child economic value into components; and indicate how various combinations of data can be used to construct a number of alternative measures of child economic value. Viewing child economic value as the present discounted value of the stream of income and services each child provides his parents during their lifetime, this model concentrates on measuring/estimating the value of a child's productive activities in his parents' household and the value of his concurrent or subsequent cash in-kind contributions. Suggested measurement methods include 12 measures of child productivity used in conjunction with: parental expectations; actual past and present child contributions; and actual contributions from adult respondents to their parents. (JC)

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AN ECONOMIC METHODOLOGY FOR MEASURING THE BENEFITS FROM CHILDREN

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AN ECONOMIC METHODOLOGY FOR MEASURING THE BENEFITS FROM CHILDREN

PREPARED UNDER A GRANT FROM THE ROCKEFELLER FOUNDATION

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PREFACE

The issues discussed in this report arose during a research project supported by Rockefeller Foundation Grant RF73030(E7352) and conducted in collaboration with the Division of Human Development of the Institute for Nutrition in Central America and Panama (INCAP). The project is primarily concerned with socioeconomic and biomedical influences on birth intervals and the length of lactation in five Guatemalan villages. Variations in the economic value of children to their parents are hypothesized to be one factor influencing differences in birth spacing and lactation behavior in the sample. It was therefore necessary to formulate a survey strategy to solicit information on child economic value along with the other variables of interest.

This report explores what elementary economic considerations suggest about the components of child value. It also presents alternative measures that are consistent with the economics and might be useful in different kinds of survey situations. However, the specific survey strategy and questions used in Guatemala are not discussed here.

The report should be of interest to the following persons:

1. Researchers and policymakers who suspect that children's economic contribution to national product and to the distribution of income among families may be substantial and want to know its magnitude.
2. Researchers and policymakers who want to know whether certain public policies are likely to affect children's economic contribution.
3. Researchers and policymakers who seek understanding of the persistence of large familes among poor people, even in the face of increasing supplies of cheap and effective contraceptive materials.
4. Surveyers and researchers who want, for whatever reasons, to measure the value of children.

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SUMMARY

This report suggests a simple economic framework for thinking about the value of children to their parents and uses this framework to propose alternative methods of constructing empirical measures of child value. Survey and research use of these empirical measures in less developed countries should facilitate study of the amount and distribution of children's contribution to national output; the economic benefits of health, nutrition, and schooling changes; the persistence of many rural people in having large families; and the failure of many parents in traditional settings to use available schools, nutritious foods, and health care for their children.

For any of these purposes, the measures proposed here should be superior in several respects to the attitudinal and objective measures in common use. First, the measures are derived explicitly from a conceptual framework that is directly related to a large body of economic literature. Second, they facilitate the separation of a child value into components, indicating the data that must be obtained to measure child value and suggesting the role of component variables that may be of interest in their own right. Third, the measures are under some conditions equivalent, allowing different survey approaches under different conditions and facilitating validity checks.

One way of viewing child economic value at the conceptual level is as the present discounted value of the stream of income and services each child provides to his parents during their lifetime. This formulation points to a particular set of factors that determine the economic value of a child: the value of a child's productive activities within his parents' household, the value of his concurrent or subsequent cash and in-kind contributions to them, the parents' or society's discount rate, and the number of years that both the child and one of his parents can be expected to live. This report concentrates on possibilities for measuring and estimating the first two factors and on methods of combining the resulting estimates into conceptually appropriate measures of total child economic value.

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Suggested methods for measuring cash and in-kind contributions from children to parents involve eliciting parental expectations about their children's future contributions, documenting actual past and present contributions from children, and documenting actual contributions from adult respondents to *their* parents. The first approach is prospective and expectational, the latter two are retrospective and objective. In addition, twelve measures of the value of children's productive activities within their parents' household are derived from basic economic considerations and evaluated in terms of their comparability and ease of surveying and construction under various conditions. Each of the measures is constructed from specific information on some combination of the following variables: amount of time children of known age and sex spent in specific household productive activities; amount of time an adult household member of known sex spent in these activities;[1] children's market wage rate; household adult's market wage rate; children's marginal product in specific household productive activities; household adult's marginal product in these activities; amount of time of children relative to an adult household member spent in specific household activities; share of children's time in total time of all household members spent in these activities; children's contribution to output of these activities relative to that of an adult; children's contribution to output of these activities relative to that of all family members combined; ratio of children's marginal productivity in these activities to that of an adult household member in the same activities; amount of physical output from these activities; monetary value of total family output from the activities; and monetary value of a unit of output from the activities.

Since each of the twelve measures requires survey information on a different combination of these variables, the aggregate measure of the economic value of a particular child or type of child to his parents can be constructed from different types of data on different types of activities and for different types of families and communities. For

[1]All information on children in this list should specify the child's age and sex; all information on adults should specify the adult's sex.

example, some measures require information on time input by children, others require information on time input by adults (which is generally more reliably surveyed), and several require no time input information at all. In situations where parents value the participation of a child in a particular activity for more than economic reasons, some of the proposed measures capture the total value, economic and noneconomic, while others measure only the economic component.

Unfortunately, most of the measures suggested are not simple to put into operation in the field, though none involves more complications than collecting the data necessary to compute annual family income, itself a very simple conceptual construct. As with the measure of income, the measure of child economic value for a particular purpose can and should be precise at the conceptual level. Survey data should be collected and empirical proxies constructed to correspond to the precise concept chosen. This report proposes a particular concept of child economic value thought to be of quite general applicability and suggests how survey data might be gathered and used to construct useful proxies for the concept in different kinds of situations.

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I. INTRODUCTION

This report suggests a simple economic framework for thinking about the value of children to their parents and uses this framework to propose alternative methods of constructing empirical measures of child value. Scientific understanding of a number of important topics, particularly some concerning less developed countries, could be considerably enhanced were objective measures of the economic value of children available. However, there are few such measures available,[1] and there has been remarkably little effort to suggest how they might be obtained, or even to clarify the conceptual problems involved in measuring child value.

This report is an attempt to begin to fill this gap. We proceed from a simple conceptual framework that incorporates several of the elementary tools of economic analysis. Use of such a framework has several advantages. First, it should make investigations of child value more useful by tying them to an existing body of scientific

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[1] Four recent surveys--Nag, 1972; Hoffman and Hoffman, 1972; Mueller, 1975; and Repetto, 1975--report no objective comprehensive evidence on the economic value of children, though there is fragmentary information from a number of countries. Nag's survey of literature and data on the economic value of children indicated that while it is possible to make crude aggregate comparisons (for example, on the basis of labor force participation rates of children) and although there is qualitative information on the economic contributions of children, comprehensive quantitative measures of the economic value of children have not been constructed. Hoffman and Hoffman discussed a number of studies where parents were surveyed as to the reasons why they had children. Economic reasons were frequently mentioned, at least in less developed areas. No study was noted, however, in which the economic contribution of children to parents was actually measured.

Mueller reviewed the evidence concerning children's contributions in peasant agriculture. Much of the work she cites relies on rather arbitrary factors relating children's productivity to an adult standard and ignores contributions of children less than ten years of age. No systematic treatments at levels of aggregation below the nation are reported. Repetto surveyed the literature on children's value in labor markets and nonagricultural household production and in old age support of parents. Here too, tentative conclusions must be pieced together from fragmentary bits of evidence from different sources.

literature. Second, the framework helps make explicit the conceptually ideal measure of child economic value, providing a standard against which operational approximations of the ideal measure can be evaluated. Third, the framework allows separation of child economic value into its components, helping to suggest the data that must be obtained to measure it. Moreover, the components are of interest in their own right. Finally, the framework indicates how various combinations of data can be used to construct a number of alternative measures of child economic value, each of which serves as a proxy for the conceptually appropriate measure. These alternatives can be used as cross-checks on one another. Furthermore, because of differences in data availability and in the types of economic functions that children perform, one measure may be more appropriate under a given set of circumstances than another.

IMPORTANCE OF THE ECONOMIC VALUE OF CHILDREN

There are a number of reasons why measures of the economic value of children are potentially important and useful.[1] First, there are few data on the contribution that children's home production of goods and services, particularly those that are not sold, makes to a nation's real output, although in some countries it must be substantial. Further, it would be interesting to know how the amount of this production varies by rural or urban residence, high or low income families, and farming or nonfarming families, and what happens to the size distribution of family full income when children's production is measured and included.

Second, if a well-formulated measure of child value were available, it could be used in evaluating the economic benefits of health, nutrition, and schooling changes in less developed countries. Little is known about the differential work capacity, performance, and earnings of healthy and well-nourished adults relative to persons in poorer condition; nothing is known about the effects of health and nutritional status on children's ability to work in their parents' fields and homes and in market jobs.[2] Yet a substantial portion of rural families'

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[1] For additional perspective, see Schultz, 1974.

[2] However, some admittedly crude estimates are provided by Selowsky, 1971. He uses data from several sources to make indirect estimates of

income and a significant part of national income in some countries probably result from children's work for their parents.[1]

Similarly, the high economic value of primary schooling in salaried labor is well documented in several less developed countries, but there is little information on the economic value of schooling in these countries' traditional agricultural sectors.[2] In particular, we know no systematic evidence concerning the effects of schooling on children's productivity in field and home. Yet, again, any effects in this area might have important implications for the size of national income, as well as for its distribution among families.

Finally, a measure of the value of children may be of considerable usefulness for interpreting and possibly influencing the behavior of parents, particularly as it affects economic development. Consider, for example, these questions:

1. Why do rural couples, even in contracepting populations, have larger families on the average than urban couples in the same culture? To what extent are children more economically valuable to their parents in rural than in urban settings, in low socioeconomic status than in high status groups, and in less developed than in industrialized countries? Are there particular cultural, economic, institutional, or legal factors that contribute to differential economic usefulness of children (and, therefore, to differential fertility) and that are affected by public policies in poor countries or by other policies that might be proposed?

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the private rate of return to good childhood nutrition in Latin America. Including estimates of the effects of nutritional status on years of school completed and on earnings in the labor market, he suggests that investment in early nutrition has a high economic payoff.

Research is also underway in the Biomedical Division of INCAP in Guatemala on the differential agricultural work output of adults with carefully measured differences in nutritional input.

[1] Because rural children in less developed nations seem likely to be of greatest economic value to their parents, specific examples in this report generally pertain to such children. However, the basic concepts presented are not limited to rural or less developed areas.

[2] See Schultz, 1964, pp. 201-205; and Schultz, 1968, pp. 129-138, for reviews of some of the research in these areas.

Available evidence suggests that children in many agricultural societies are economically useful to their parents in household production and in providing old age support,[1] that parents are aware of their children's economic value,[2] and that parents consider this value to be an important motivation for having children.[3] A six-country study has found that fertility is higher in countries and socioeconomic groups where more parents give economic value as an important reason for having children.[4] There are also scattered indications that fertility is higher where children are in fact more economically active, statistically holding constant income, rural-urban residence, parental education, and several other factors.[5]

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[1]See the review of the ethnographic and time budget literature on this subject in Nag, 1972. Also Fortes and Fortes, 1936; Fortes, 1938; Fortes, 1949; Lewis, 1951; Johnson, 1971; and Haswell, 1953. Mueller, 1975, and Repetto, 1975, conclude that children do not appear to be a good investment for parents in traditional societies when costs of children are taken into account. However, this conclusion might be altered by more complete inclusion of the value of children in household production of nonagricultural services and the returns from children in the form of services in old age. Both kinds of contributions *seem* substantial in many traditional settings and are not well documented in the studies these authors cite.

[2]Mueller, 1972; East-West Population Institute, 1974; Anker, 1973.

[3]Mueller, 1972; Anker, 1973; Heisel, 1968; Dow, 1967; Martin, 1970; Guthrie, 1968; Poffenberger, 1968; Caldwell, 1967, 1968; Newton, 1967; East-West Population Institute, 1974.

[4]The Value of Children Project has preliminary results indicating that, among advantages mentioned for having children, the economic benefit of children is the most powerful predictor of fertility levels across six countries and across high, medium, and low SES groups in each country. More than half the respondents in every country and SES group but one mention happiness, love, and companionship as advantages of having children. This type of advantage is so frequently mentioned that its predictive power for fertility appears low, whereas the economic reasons vary greatly in importance among countries and have the expected relationship to fertility. These results from Korea, Taiwan, Japan, Hawaii, the Philippines, and Thailand are found in East-West Population Institute, 1974.

[5]Harman, 1970; DaVanzo, 1972; Kasarda, 1971. As Harman and DaVanzo point out, these statistical associations are subject to several causal interpretations, even when the associations are estimated in a multivariate simultaneous equations framework. Nag, 1972, discusses problems with data of these kinds.

2. Are children of one sex economically more useful in particular circumstances? If so, is this relative advantage associated with high fertility to assure an adequate number of the more valuable sex? Is this relative advantage associated with better care of children of the more economically valuable sex?[1] To what extent does this relative advantage diminish as economic development proceeds and as particular environmental factors change?

People express a preference for sons in the majority of poor cultures, as well as in others not so poor. In addition, there is preliminary evidence that couples in several cultures have more children, other things equal, if the proportion of girls to boys among their children is very high.[2] However, we do not know much about the relative importance of particular aspects of family and economic life or the particular cultural patterns or institutional factors that may be responsible for a preference for sons. Part of the answer may be that in many economic and institutional settings, sons are economically more valuable.

3. Does the future economic gain from school attendance exceed the loss in current production that results from a child attending school rather than working? Is there an economic payoff to the time and money payments parents must make to have a healthy, well-nourished child? Estimates of the economic value of children may reveal whether the apparent perversity of poor parents in rural areas--for example, failure to send children to school or provide them with sufficient food--stems partially from a lack of economic incentive to behave differently.

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[1] Differences in infant and child mortality by sex should be an excellent index of differential nutritional and health treatment of male and female infants in poor populations. Welch, 1974, finds that infant and child survival probabilities in an East Pakistan sample are significantly associated with the sex composition of children in the family. Girl babies born into families that already had more boys than girls have a significantly greater chance of survival than other girl babies.

[2] Welch, 1974, presents strong evidence from large samples in the U.S. and East Pakistan.

Even though there are clearly many factors that influence fertility decisions and decisions by parents to invest in their offspring,[1] the economic value of children seems to us of importance because some of its determinants may be especially sensitive to government policies and to economic development processes. In this light, we feel that future work should move beyond searching for gross correlations, concentrating instead on identifying the principal components and principal determinants of the economic value of children in particular circumstances. Understanding these factors is necessary in predicting changes in child economic value that are associated with alternative economic development strategies or with particular government policy measures and, consequently, in predicting the side effects of these strategies and policies on family income and incentives to bear and invest in children. Scientific understanding of these topics at present is very incomplete and ambiguous, in large part because the data required to measure the economic value of children are severely limited.

SCOPE OF THE STUDY

Our primary purpose in this study is to formulate survey strategies appropriate for gathering these data and to suggest how these data can be used to construct alternative measures of the economic value of children, though our approach also has direct application to measuring non-economic aspects of child value. We indicate which alternative measures of child economic value might be used in particular survey situations and argue that the survey information collected should always correspond

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[1] In the case of fertility behavior, for example, costs of child rearing in terms of money, parental time, and psychological or social strain must also be considered as important influences. So must the returns and costs of other goods, services, or activities that parents could partly substitute for the economic or affective value provided by children. (Insurance, savings accounts, new varieties of seed, and modern agricultural machinery are examples of goods that might substitute for children's economic value. Travel and satisfying social or work roles for women might substitute for children's affective value). Factors that affect fecundity such as past and current diet and health are also important. Finally, risk of pregnancy is affected by patterns of marriage, living, and working and by the costs (in money, acquisition time, inconvenience, and discomfort) of alternative means of fertility control.

as closely as possible to concepts suggested by theoretical considerations. Unfortunately, most of the measures we suggest will not be easy to put into operation in the field. Some, in fact, are very difficult, although even these should not entail more serious problems than gathering the data necessary to compute annual family income, itself a very simple conceptual construct.

With child economic value, as with income, the usefulness of subsequent data analysis depends on how closely the data approximate the theoretical construct. In turn, a good approximation by the data depends on knowledge of family economic patterns in the particular population sampled. This report should assist with the first requirement; the second can be fulfilled only through familiarity with the study population. We do not detail field methods of obtaining the data discussed or the various biases that may arise from observation, interview, questionnaire completion by respondent, or impressions obtained from talks with community leaders--all methods that may be useful in gathering data on particular variables. These questions of survey design and operation are not peculiar to our topic and are covered in other sources.[1]

Section II presents a conceptual measure of child economic value that guides the discussion throughout the rest of the report. Section III discusses alternative empirical proxies for the variables appearing in the conceptual measure, and Section IV suggests research and survey strategies that could be used in different kinds of situations. The appendix presents algebraic derivations of the empirical proxies discussed in Section III.

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[1]See, for example, Babbie, 1973; and Lansing and Morgan, 1971.

II. A CONCEPTUAL MEASURE OF CHILD ECONOMIC VALUE

One way of viewing child economic value at the conceptual level is as the present discounted value of the stream of income and services each child provides to his parents during his parents' lifetime. Although alternative formulations are also possible, the conceptual measure implied by this formulation is a useful starting point because of its simplicity and because it points to the different types of data needed to construct a variety of alternative operational measures. The conceptual measure, CV, that is consistent with this formulation may be algebraically represented as follows:

$$CV = \sum_{t=1}^{T} \frac{(h_t + m_t)}{(1 + r)^t}, \qquad (1)$$

where h is the value of a child's productive activities within his parents' household, m is the value of his cash or in-kind contributions to his parents, r is the society's or parents' subjective discount rate, t is an index of years beginning at the child's birth, and T is the number of years the child may be of economic value to his parents.[1]

The value of CV for an individual child obviously depends on the values of h, m, T, and r. Most of the remainder of this report is concerned with methods of estimating h and m, and it is necessary to discuss T and r only briefly. T, the number of years the child may be of economic value to his parents, is simply the expected number of years to the child's death or to his parents' deaths, whichever comes first. Accordingly, T can be calculated from mortality tables as the number of

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[1] In a frequently used partitioning, Leibenstein, 1957, p. 161, distinguished three types of returns to parents from children: utility derived from the child as a consumption good, returns from the child as a productive agent, and returns from the child as a potential source of security. Our dichotomy of the economic returns into h and m is different from the dichotomy in Leibenstein's last two categories. For the purpose at hand, the present partitioning is preferable because it corresponds to two different sets of techniques for measuring these returns, depending on whether the return is generated inside or outside the parents' household.

years after a child's birth that both he and his parents can expect to live.[1] For the first five years at least, both h and m are generally zero. Some time thereafter, the child may begin to make nonpsychic contributions to his parents' welfare by caring for younger children, keeping house, preparing food, or helping at harvest time, for example. The child may continue to contribute in the form of cash, payments in kind, or physical help even after leaving home, so long as he and one of his parents are still alive.

The discount rate (r in Eq. (1)) reflects the degree to which society or parents place a higher value on goods and services received from children during the present period than on the same amount of goods and services received during some future period. The value of the discount rate in a particular situation depends on a subjective weighting of present versus future satisfactions. Persons who are willing to trade much satisfaction in the future for a little satisfaction today have a high discount rate. Future economic contributions from children mean little to them. Since not much is known about the magnitude of subjective discount rates, an advisable research course is to compute child economic value using a broad range of alternative rates.[2]

The measure of child value that is implied by Eq. (1) is purposely restricted. Consequently, for some research purposes this measure may have to be modified or augmented by measures that incorporate other aspects of child rearing. For example, Eq. (1) is intended to capture only the *economic benefits to parents* of having children. Children, of course, generate costs as well as benefits. Measuring the costs of children is at least as complex a subject as measuring their value and is simply beyond the scope of this study. Moreover, children's economic value is only part of their total value to their parents and

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[1] In addition, the value of T might be considered endogenous for some purposes, since the length of time a child will live is partly determined by his parents' investments in him. Grossman, 1972, reports an economic model of health in which life-span is an endogenous variable.

[2] For a more detailed explanation of the discount rate, see any price theory text--for example, Henderson and Quandt, 1958, pp. 228-229.

generally a smaller part in more industrialized settings.[1] However, since under certain circumstances several of the methods we propose for estimating h capture a child's noneconomic value to his parents as well as his economic value, we shall have more to say about the noneconomic aspects of children's activities later. In addition, estimation of children's contribution to national production may be the goal in some studies. Inclusion of m in the measure would risk double counting in these cases; and the child's lifetime, rather than the parents', would be the appropriate period over which to sum h.

Another important feature of Eq. (1) is that it provides a measure of actual child value. Although for many research purposes this is the most appropriate kind of measure, some of the research issues discussed in Section I require a measure of *expected* child value, since it is expectations that are hypothesized to influence parents' or policymakers' decisions. Moreover, parents may recognize that their expectations about future returns from their children could be in error and attempt to take this uncertainty into account when making decisions. In Section IV, we comment in more detail on the circumstances under which a measure of actual child value, as opposed to a measure of parental expectations, is most useful.

It should also be noted that CV in Eq. (1) is a measure of a child's *total* economic value to his parents during their lifetimes. This implies two different types of summing: first over the parents' lifetimes, and second over those activities of a child that are of economic value. The first type of summing is difficult because information on a particular child is usually applicable only to a short period of time, a year or two at best. A technique for dealing with this problem is discussed in Section IV. The second type of summing is also difficult because better data can be obtained on some activities of children than on others. In Section III, we suggest how good information about a child's value in one activity can sometimes be used to help make inferences about his value in other activities.

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[1] Hoffman and Hoffman, 1972, provide a systematic review and critique of research on noneconomic aspects of the value of children.

An additional implication of Eq. (1) is that it pertains to individual children, although a more aggregated measure could, of course, be computed by summing CV across children. Since many of the research issues discussed earlier pertain to decisionmaking at the individual or household level, it seems most appropriate that the measure of child value also be defined at this level. Moreover, as will be seen in Section III, most of the data that are necessary to make Eq. (1) useful must be collected from individual families.

III. EMPIRICAL COMPONENTS OF CHILD ECONOMIC VALUE

This section proposes alternative kinds of survey information that may be used to calculate values of m and h in Eq. (1). The information needed for m, the value of children's cash or in-kind contributions to their parents, can be simply described, and several survey alternatives are available. However, eliciting data to compute h, the economic value of children's activities within their parents' household, is not so straightforward. There are several alternative approaches, but unfortunately these do not give equivalent results under conditions that may be common in many families. Our recommendations concerning how to combine these approaches in particular survey and research settings are laid out in Section IV.

THE VALUE OF CHILDREN'S CASH OR IN-KIND CONTRIBUTIONS TO PARENTS (m)

Children may be of economic value to their parents by either serving as unpaid workers within their parents' household (represented by h in Eq. (1)) or working outside the household and turning all or part of the proceeds from this work over to their parents (represented by m). Cash contributions to parents from work outside the home can occur while the child is still living at home or after he has moved away. After the child has established his own household, he may also make in-kind contributions to his parents (for example, food produced on his own land). So that in-kind contributions can be added to cash contributions in computing m, market prices for commodities must be used to convert in-kind payments into equivalent cash values.

There are three alternative, but not necessarily mutually exclusive, approaches to obtaining values for m. One is to ask parents of young children what future contributions they expect to receive from each of their children at different points in their children's lifetimes. In some survey situations parents have quite specific requirements in this area. For example, parents can be asked how much money, goods, and services they expect each of their children to contribute toward their support in their old age. They can also be asked if, when,

and for how long they expect their child to work outside the home and how much they expect the child to turn over to them each month. The second approach involves asking a sample of parents what each of their children actually contributed to them last year (or month) from work outside the household. The reference period can be extended further into the past using retrospective survey methods, and the questions can be made specific according to types of contribution and dates or ages at which the contributions began. The third approach is to ask similar questions about what the respondents have contributed to *their* parents.

The advantage of the first approach is that it provides information on the flow of m that parents expect to receive during the rest of their lives. The second and third approaches provide retrospective information on only a part of the relevant time period, although in Section IV we describe a technique that can be used to draw inferences about the value of m at other periods of a parent's life. Use of the third approach exclusively would assume that patterns of assistance to parents have not changed significantly over the space of one or two generations. The latter two approaches should measure m more accurately. Of course, information from several approaches can be combined in constructing a final measure.[1]

THE VALUE OF CHILDREN'S ACTIVITIES IN THEIR PARENTS' HOUSEHOLD (h)

Before we define the alternative measures of h, it may be useful to indicate what is meant by the term "the value to parents of children's household economic activities." The word "household" indicates that a market wage is not received for performance of the activities. The word "economic" suggests that parents value the activities primarily for their output, not for their children's participation. Examples of such activities include preparation of food, helping to clean the

[1] In a predictive framework, the relative usefulness of each approach ultimately depends on whether parents' fertility and child investment behavior, for example, is more accurately predicted by parents' expressed expectations of the future or by estimates derived from what is observed actually to take place.

house, and working in family agriculture. Many other activities of children seem important to parents primarily because of the activities affective or utility value (for example, a child's kiss or play activities) or as investments to increase future production, income, or general well-being (school attendance).

Although we are concerned here with child activities whose current economic component is likely of primary importance, the utility and investment components may also contribute to their value to parents. If so, these components will under certain circumstances also be incorporated into our measures of child value. For purposes of initially defining the alternative measures, we shall assume that the entire value of activities in which we are interested is economic. Later, we shall consider possible distortions in these measures that may occur when the affective and investment components of an activity are fairly large.

The economic value of labor is usually measured in terms of the earnings the labor commands in a market. However, since the productive activities that rural children perform within their parents' household occur outside the labor market, some other measure must be used. In the appendix to this report, we develop twelve alternative measures of the value of children's household economic activities. If a household allocates its resources, including the time of each household member, as if it were maximizing its utility,[1] and certain other conditions

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[1]These resource allocations may follow community or cultural custom or they may result from conscious decisions by various family members. The husband may make such decisions alone or in deliberations with his wife. Older children may also influence the allocations, especially where their own time is involved. Any of these decision processes is consistent with the assumption of family utility maximization. The important implication of the assumption is that the household resources, including the use of children's time, are allocated so that their marginal value in each alternative use is equal to whoever makes the allocative decisions.

There are theoretical reasons for expecting families who live and work in a technical, social and economic environment that has been the same for centuries to have learned the most efficient ways of allocating their resources. Considerable empirical evidence indicates that this is the case in traditional agriculture. See Schultz, 1964. Families whose environment is changing more quickly than they can adjust

that are described in the appendix also hold, the value of each of these measures will be equivalent. The analysis presented in the appendix also suggests that the measures of a child's value are more nearly correct for productive activities for which parents have easy access to other inputs that can take the place of the child.

The measures are computed as the multiplicative products of different--but overlapping--subsets of variables. One advantage of being able to choose among several measures is that the availability and reliability of data on these alternative subsets of variables will vary among the household economic activities and geographic areas being studied. Another advantage is that some measures will on occasion provide better theoretic approximations of child economic value in household production than others. The conditions under which this is true are discussed in some detail in the appendix and will be briefly noted later in this section.

Our primary intent here is to define the variables underlying the alternative measures and to suggest possible sources of data on these variables.[1] A list of the variables is found in Table 1. Except when we specifically indicate otherwise, we shall assume for purposes of discussion that the variables are used to measure the value of an individual child's participation in a single household economic activity over a finite time period.

- Measure 1 of h equals the child's time spent in the activity times the child's shadow wage rate.
- Measure 2 of h equals the child's time spent in the activity times the value of the child's marginal product in that activity. The value of the child's marginal product, in turn, equals his marginal physical product times the value of a unit of output from the activity.

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may be operating less efficiently than is possible at any moment, but they seem generally to behave as though they are *moving toward* efficient resource allocation in the changed environment. See Schultz, 1975.

[1] In an attempt to reduce confusion, throughout this section we use the term "measure" to refer to a measure of child value and the term "variable" to refer to a component factor in one or more measures. No "variable," in itself, is a complete measure of child value.

Table 1

VARIABLES USED TO CONSTRUCT ALTERNATIVE MEASURES OF THE VALUE OF CHILDREN'S HOUSEHOLD ECONOMIC ACTIVITIES

Variable Name	Variable Symbol Used in Appendix	Alternative Measures											
		1	2	3	4	5	6	7	8	9	10	11	12
Time input	c or a	C	C	A	A	A	A	A	F	C	C		
Shadow wage rate	w	C		A		A		C	C	A			
Marginal productivity	MP		C		A		A				A		
Contribution to output relative to adult	r			C/A	C/A								
Contribution to output relative to family	s					C/F A/F	C/F A/F					C/F	C/F
Time input relative to adult	v							C/A					
Time imput relative to family	x								C/F				
Productivity relative to adult	u									C/A	C/A		
Family output	y											F	
Value of family output	H												F
Unit value of output	p		F		F		F				F	F	

Key

C: Child
A: Adult
F: Family
C/A: Child relative to an adult
C/F: Child relative to his family
A/F: Adult relative to his family.

- Measure 3 equals the time spent by an adult in the activity times the adult's shadow wage rate times the child's reported contribution to the output of the activity relative to that of the adult.
- Measure 4 equals the time spent by an adult in the activity times the value of the adult's marginal product in the activity times the child's reported contribution to the output of the activity relative to that of the adult.
- Measure 5 equals the time spent by an adult in the activity times the adult's shadow wage rate times the reported fraction of labor's contribution to the family's production in the activity that can be attributed to the child, all divided by the reported fraction of labor's contribution to the family's production in the activity that can be attributed to the adult.
- Measure 6 equals the time spent by an adult in the activity times the value of the adult's marginal product in the activity times the reported fraction of labor's contribution to the family's production in the activity that can be attributed to the child, all divided by the reported fraction of labor's contribution to the family's production in the activity that can be attributed to the adult.
- Measure 7 equals the time spent by an adult in the activity times the child's shadow wage times the reported child's time input to the activity relative to an adult.
- Measure 8 equals the time spent by all family members in the activity times the child's shadow wage times the reported child's time input to the activity relative to the time input of all family members.
- Measure 9 equals the child's time spent in the activity times an adult's shadow wage rate times the reported child's marginal productivity relative to that of the adult in the same activity.
- Measure 10 equals the child's time spent in the activity times the value of an adult's marginal product in the activity times the reported child's marginal productivity relative to that of the adult in the same activity.
- Measure 11 equals the reported fraction of labor's contribution to the family's production in the activity that can be attributed to the child times the amount of output from the activity times the unit value of output.

• Measure 12 equals the reported fraction of labor's contribution to the family's production in the activity that can be attributed to the child times the total value of output from the activity.

One of the measures listed in Table 1 would have to be computed for each of the several household economic activities that most children are likely to engage in. These values are then combined to compute h, a figure that reflects the total value of a child's output from household production.[1] This could really be done if data on all the variables in *any* of the columns in Table 1 could be obtained for each household economic activity in which children are important. The alternative measures are sufficiently varied in their data requirements that this is likely to be the case. If so, the measures of value of the child's output from different tasks can be directly summed. This sum, h, can then be added to estimates of m.

An examination of Table 1 suggests that several variables are either measured for individual children (time input, shadow wage rate, marginal productivity) or compare individual children with an adult or with the rest of their family (time input relative to an adult or to the family, contribution to output relative to an adult or to the family,

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[1] If the behavioral assumptions under which the alternative measures are equivalent were closely approximated by reality, the economic value of a child to his parents during a time period would be adequately measured by estimating the marginal value product of the child in just one activity and multiplying it times the amount of time the child spends in all productive acticity during the period. Furthermore, parents could be assumed to allocate their child's time among all activities--those yielding primarily economic returns and those yielding primarily noneconomic returns--in a way that equates his marginal value product in each. Hence, the child's total value, economic and noneconomic, could be measured by multiplying the estimated marginal value product in any one activity times the total time (or total time awake) of the child. Assuming this total time to be the same for all children, variation in child value could be measured by variation in marginal value product alone.

However, where observed behavior reflects imperfect allocation of time among competing activities, child economic value may be better approximated by summing the contributions of the child in each of the various activities in which he engages. Furthermore, this single measure of child economic value or total child value would not be appropriate for several of the purposes listed in Section I.

productivity relative to an adult). The former variables are estimated from objective survey data, while the latter rely on parents' opinions about a child's relative contribution. Comprehensive measures of the value of a child's participation in a household economic activity can be obtained only by combining two or more variables, as indicated in the various columns of Table 1. By itself, however, each of these variables may provide considerable, although incomplete and possibly biased, information. Possible biases that may occur in using each of these variables alone as a proxy for child economic value, rather than in the indicated combinations with other variables, are considered in Section IV.

All but the last two of the measures listed in Table 1 require direct estimates of the amount of time a child, an adult, or all members of the family spend participating in a particular household economic activity and of the child's or adult's shadow wage rate or marginal productivity. Measures 11 and 12 require instead information on the family's total output from the activity. For reasons discussed in the appendix, however, these last two measures will be biased upward if nonlabor inputs such as tools or land also contribute to total output from the activity. Moreover, these two measures become increasingly biased as the contribution of nonlabor inputs increases. Measures 11 and 12 will also provide misleading comparisons of children in different families, if the use of nonlabor inputs varies substantially across households.

The first ten measures may be divided into two distinct groups: 1, 3, 5, 7, 8, and 9 all require a shadow wage rate variable; 2, 4, 6, and 10 utilize both marginal productivity and unit value of output variables. In cases where only the output of the activity, not the fact that the child has participated in it, has value to the parents--because the output can be sold for income, it is used in the home to make something of value, or it yields direct utility value--all ten measures are conceptually equivalent. In many cases, however, the total value of a child's participation may exceed the worth of his current output. For example, parents may value a child's participation in an activity because they feel he is learning something that will be

useful to him or them later in his life, or because they value the simple fact of his participation (the child may be kept busy and out of mischief, or the parents may be proud to attribute the output from the activity to their child). We demonstrate in the appendix that the six measures that use shadow wage rates (1, 3, 5, 7, 8, and 9) capture the full value to a family of a child's participation in household activities, the economic as well as any additional components; but measures that use the product of marginal productivity and the unit value of output (2, 4, 6, and 10) incorporate only the economic value.

Several of the measures listed in Table 1 (especially 3 through 8) have been formulated so that direct estimates of the time inputs and shadow wage rates or marginal productivities of adults, rather than of children, are used. As should become clear later, it seems reasonable to expect that such variables are easier to obtain in the field for adults than for children.

In the remainder of this section, we discuss approaches that might be used to obtain data on each of the variables that appear in Table 1.

Time Input

Most of our measures of the value of children's participation in economic activities require data on time spent, by either the child, an adult, or all family members together, in performing these activities. This information should ideally be collected at several different times over a year in order to minimize the effects of measurement error and seasonal variation. The necessary information could be collected by trained persons who either observe and record the actual activities of selected individuals or who ask various questions about past activities. In practice, the high expenses associated with the first technique would severely restrict the size of the sample. In addition, the observers' presence might change the subjects' behavior. Hence, direct observation should generally be used only to test the validity of responses to retrospective questions.

If retrospective questioning is used, it probably would be easier to obtain accurate time input information on adults than on children.[1] Adults could provide the necessary information on themselves, but such information would have to be provided by parents in the case of young children. Presumably, individuals are usually able to report more accurately how they have allocated their own time than how other family members have used theirs.

For purposes of constructing the measures, the ideal type of time input information would be complete time budgets, a listing of how all the time in a given period--say a day or week--was allocated among various activities.[2] Such precise information, however, can usually only be collected at high cost. Reasonably accurate information on time spent in major household production activities such as working in the fields often can be obtained accurately; but retrospective data on time spent at such tasks as carrying water, gathering wood, or going to the store probably cannot be. As a proxy for time spent at such tasks, one might use frequency of occurrence over a given time period (for example, the number of times each child in a household carried water last week).

Shadow Wage Rates

The value of the last increment of time (say an hour) that a person uses in performing some task is known as his "shadow wage rate."

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[1] Among other problems is that younger children frequently mix play with work activities so that documenting work time reliably is difficult.

[2] Most time budget studies have been conducted in developed countries, although often among rural people, and most of these have utilized retrospective questionnaire methods. See Reid, 1934, and references therein; Morgan et al., 1966; Walker, 1969; Manning, 1968; and Szalai, 1966, for example. A number of studies, some using combinations of interview and observational techniques, have also been conducted in less developed countries. See Warren, 1957; Bravo and Barrerra, 1961; Valee and Vargas, 1962; Nelson, 1963; Maceda, 1958; and Crespo, 1957, among those done by home economists. Anthropological time budget studies include Salisbury, 1962; Foster, 1948; and Haswell, 1953. Nag, 1972, briefly reviews some ethnographic studies of time use. Finally, Guilbert et al., 1965, discuss problems in collecting time budget data.

If his time is allocated efficiently, the value of his shadow wage rate in any particular task should be approximately the same as its value in any other task.[1] Otherwise there would be an incentive to reallocate the individual's time so that more was devoted to tasks where his shadow wage was high and less time was used in tasks where his shadow wage was low.[2]

Equality in the shadow wage across activities implies that once the magnitude of the variable is found for any one activity, it can be used to compute measures of the value of an individual's participation in any other activity. Unfortunately, the only activity for which an individual's shadow wage can be directly observed is paid employment outside the household, where the shadow wage rate simply equals the market wage.[3] Since a considerably greater portion of adults than children are likely to have observable market wage rates, there is some advantage to using a measure, such as 3, 5, or 9, that relies on a shadow wage variable for adults rather than a measure, such as 1, 7, or 8, that depends on a shadow wage variable for children.

Even among adults in a less developed country there may be a substantial number who do not participate in the market labor force. For these persons, there is little choice but to impute shadow wage rates on the basis of wages reported for persons with similar characteristics who do participate. This is done by assigning the market wage of those who do work in the market to those with similar demographic and economic

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[1]This shadow wage is net of any expenses the individual incurs in using his own labor, such as transportation to the job.

[2]An additional assumption is needed if this reallocation of time is to bring the two shadow wages into equality--that the value of the marginal product of the child's time in each activity is declining. In other words, the amount of value that results from an additional unit of the child's time in production, holding all other inputs constant, grows smaller as more and more of the child's time is allocated to production.

[3]This equality is expected for the same reasons that one expects equality among the shadow wage rates of a person in alternative household activities.

characteristics who did not participate in the market.[1] At best, however, this procedure provides only an estimate of what persons who do not choose to work outside their household could potentially earn in the labor market. But the very fact that these persons have elected not to participate in the market suggests that their shadow wage for household work exceeds their potential market wage. There are, in addition, several other problems in imputing wage rates to nonmarket workers.[2] However, considerable current research on these topics is resulting in improved statistical techniques for imputing wages.[3]

Marginal Productivity

Several of the measures found in Table 1 require a marginal productivity variable for either a child or an adult. Conceptually, this variable is defined as the addition to physical output that results from a small increase in the amount of time an individual devotes to a given activity, holding constant all the other factors that contribute to output.

An individual's marginal product varies among different household economic activities according to his own proficiency among tasks and

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[1]One statistical procedure for doing this is to use regression techniques to estimate a wage function for a sample of persons reporting wages. Their reported wage rates are regressed on variables that are hypothesized to affect productivity and wage levels--for example, age, education, work experience, and geographical variables. The wages of nonworkers can then be imputed by substituting their characteristics into the wage function.

[2]For a nontechnical discussion of methods and difficulties of imputing wage rates for nonlabor market participants, see DaVanzo and Greenberg, 1973, pp. 31-36. For theoretical treatments see Cogan, 1975; and Gronau, 1972 and 1973.

[3]An alternative to shadow wage rates for evaluating units of individual's time in various activities has been suggested by Harris, 1971; and Nag, 1972. They suggest that the amount of caloric energy expended in each activity over a given increment of time could be used. They further suggest that existing estimates of these expenditures could be used in widely different cultural settings. Unfortunately, however, caloric expenditure is an input measure rather than an output measure. In addition to other serious conceptual problems, increased inefficiency and increased output would be indistinguishable with use of this measure.

the type and amount of other productive factors that are used. We note in the appendix, however, that under certain circumstances the *value* of marginal product (that is, the marginal product times the market price of a unit of output) equals the shadow wage rate; consequently, the value of the marginal product in different activities would be the same. In these cases, once the value of the marginal product was estimated for any one household activity, it could then be used in estimating the value of a child's output in all other activities.

It is quite likely, however, that the theoretical conditions necessary for equality in the value of marginal products will not be perfectly met. This will occur, for example, if different children's activities vary in their noneconomic value to parents or if a child's time at a given moment is not perfectly allocated among competing activities. Moreover, even if the theoretical conditions hold, it is unlikely that the value of a child's marginal product will be perfectly measured for any one activity. Thus, it may be desirable to estimate the value of a child's marginal product for as many activities as possible and hope that any errors are offset or reduced.

There are three techniques for estimating marginal productivities in household economic activities. The first can be used only when the quantity of output produced and the amounts of inputs to a household economic activity are known for a cross-section of families. Agricultural production is an important example of an activity for which such data are often available. In these cases, econometric techniques can be used to estimate a "production function" that will indicate the change in output resulting from an incremental addition in a particular factor of production--say, a one-hour increase in a child's time input.

Direct tests of performance of certain household tasks (for example, speed of husking corn or making tortillas) provide a second technique for measuring productivity. Under assumptions that are often met in the case of poor rural households' productive activities, the results of these tests should be highly correlated with the marginal product of individuals. They probably will not, however, provide a very exact estimate of the absolute magnitude of the marginal product--that is,

the increase in output that would result if an individual worked, say, an hour longer than usual at given tasks.[1] Thus, performance test results should be viewed as proxies for the actual marginal products of persons.

A third possibility is simply to ask parents (or perhaps the child himself) to estimate what their child's output from a given task usually is over an hour (for example, number of bushels of corn husked or number of tortillas made). Unfortunately, this provides an estimate of average rather than marginal productivity. Moreover, responses by parents to questions about their children's output may not be reliable. Nevertheless, the estimates resulting from these questions might in some circumstances be highly correlated with actual marginal productivity.

Relative Time Input, Relative Contribution to Output, and Relative Productivity

Most of the measures of the value of children's household economic activities that use these variables (measures 3 through 10) are based on the notion of evaluating a child's economic contribution to a family in terms of an adult standard. Information on these variables can be obtained by asking respondents several different questions about how much a child contributes relative to an adult or to all family members combined. By using these relative variables in combination with adult time input and shadow wage rate or marginal productivity variables, one would, in effect, measure the value of children in household production in adult equivalent units. An obvious prerequisite to collecting data on the relative variables is selecting an appropriate adult as a standard. The standard for boys should generally be a man and that for girls a woman. Although there is overlap in the household tasks performed by young boys and girls in many areas, the tasks done by each sex usually become increasingly distinct as children grow older.

The adult standard against which a child is compared might be either the child's own mother or father or a more abstract concept, for

[1] In addition, experimental biases such as Hawthorne effects may be a problem.

example, a "typical" young man or woman who has just set up housekeeping. A *possible* advantage of the abstract standard is that, in preparing their children for adulthood, parents in different families may already be implicitly comparing their children's performance with that of an abstract adult, and their conception of this adult may not vary much.[1] Assuming the child's father and mother as the adult standards, example questions might be phrased as follows:

- For r, the child's contribution to the output of an activity relative to that of an adult: "Compared with the amount of wood you chop in an average week this time of year, how much would you say your son chops?" Record answer in fractional terms, such as 1/4, 1/2, 3/4, about the same, 1/4 more, half more, twice as much.
- For s, the child's contribution to the output of an activity relative to that of all members of the family combined: "Compared with the total amount of wood chopped by all members of your family this time of year, how much would you say your son chops?" Record answer in fractional terms, such as 1/4, 1/2, 3/4.
- For v, the child's time input to the activity relative to that of an adult: "Do you or does your son spend more time chopping wood this time of year? How much more (less) time does your son spend chopping wood?" Record answer in fractional terms, as above.
- For x, the child's time input to the activity relative to that of all family members combined: "Thinking of all the time the members of your family spend chopping wood this time of year, what part of that time is spent by your son?" Record answer in fractional terms, as above.
- For u, the child's marginal productivity in the activity relative to an adult's: "If your son worked an extra hour carrying wood, would he get more or less done than if you worked an extra hour carrying wood?" How much more (less)?" Record answer in fractional terms, as above.

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[1] In this case, the *same* adult wage and time input values can be used in computing household economic value measures for children in different families. For example, the average wage received by field hands might be used as a proxy for the abstract male's shadow wage rate. The wage received by maids could be similarly used as the abstract female's shadow wage rate.

An alternative approach is to ask parents to make general comparisons of their child's and the adult standard's household production: "What portion of all the 'woman's work' in your household does your daughter do?"[1]

Family Output

It seems likely that there are several household economic activities for which the total volume of family output is reasonably well known to family members. Examples might include the total number of bushels of a crop produced on the family farm, and the amount of water carried from a well to the house over a certain period of time. Data on family output from such activities could be obtained by asking retrospective questions of parents.

Value of Family Output

Data on this variable should be readily obtained for all outputs from household economic activities that are sold in the market. Examples include agricultural products, and articles of clothing and hand-crafted items that are produced by family members for sale to tourists.

Unit Value of Output

If a good or service that is produced by a household economic activity is also exchanged for money, its unit value is simply the price at which it is sold.[2] Thus, data on the unit value of output variable can be obtained through market surveys. It is not necessary

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[1]Field testing is, of course, required to determine whether parents are able to make such general comparisons or whether reliable information can be collected only by asking questions about specific household tasks. In any case, considerable care is required to insure that the survey question taps the desired concept; respondents must answer in terms of relative *output*, not time *input*, or vice versa, as the case requires.

[2]Market prices will capture only what we referred to earlier as the purely economic value of output from household activities. Any value that parents attribute to output that was produced by their children, *because* it was produced by their children, will not be reflected in market prices.

that all of the good or service that is produced in the area being studied be sold in a market or that all households participate in the market, only that some is exchanged so that a market price can be observed. The rub comes for certain goods and services, particularly in less developed parts of the world, that are almost entirely consumed within the household that produce them; market prices are unavailable for these goods and services. Examples are the outputs of such household economic activities as babysitting, water carrying, and wood gathering. In these cases, it may be possible to develop a rough proxy for unit value by asking families to rank order the importance to them of the outputs of various household economic activities.

IV. SOME IMPLICATIONS FOR SURVEYING AND RESEARCH

Largely implicit in the discussion so far are four important points about the economic value of children. This section draws some implications from these points for research and survey design.

1. Children can be of economic value to their parents in different ways. For many research and evaluation purposes, measures of child economic value must include, and be aggregated from, information about these different activities. However, for other purposes, it is the components of child economic value themselves that we are interested in, rather than in the aggregated measures per se. For if child economic value is a significant influence on important facets of family behavior, it is important for predictive and evaluative purposes to know how these components change during socioeconomic development and in response to particular public policies.

2. Children's activities *in the household* may be responsible for much of whatever economic worth they represent to their parents, even though these activities may not be directly linked to product or labor markets.

3. Economic theory has significant implications about which aspects of family members' activities are important components of and influences on the economic value of children. Simple theoretical considerations suggest that information on these aspects is important in documenting and predicting child economic value in varying circumstances, while other aspects may safely be ignored.

4. Indicators of child economic value that do not account for all the variables in Eq. (1), or for all the components of particular measures of child household production in Table 1, are likely to be biased measures of the child's true economic worth. The direction of bias can sometimes be deduced from information about the excluded components. Whether the bias is important must be decided on a case-by-case basis and depends on the particular research or evaluation question being asked of the data.

RESEARCH STRATEGIES

These four points have several general implications for the conduct of research concerning the economic value of children. We summarize these implications only briefly here, since research methods are not the main subject of this report.

1. Profiles of Child Economic Value

The conceptual measure of child economic value in Eq. (1) indicates the need for information over the course of much of a child's lifetime. Yet, few survey projects could (or would want to) collect survey information on the same persons over such a long period. Instead, one can derive a measure of the lifetime flow of child economic value for particular children in particular kinds of families and communities by estimating a predictive equation. To do this one regresses values of m or h on a set of variables thought to be important influences on child economic value, as well as one or more variables representing the partial effect of a child's age.[1] This yields an equation that can be used to predict the flow of economic value accruing from a child in each year of his life, based on his personal characteristics and those of his family and community. The explanatory variables might include, for example, amount of land owned by the family, distance from urban center, mother's and father's level of schooling, number of older siblings, the child's age, and the child's age squared. Such a formulation would permit the relationship between child economic value and his age to be quadratic, given the effects of the other explanatory variables. Other variables can of course be entered, and other functional relationships between economic value and age can easily be experimented with.

An example of the sorts of results such a procedure might produce is found in Fig. 1, where the different curves represent children with different sets of personal and family characteristics. For example, Curve A might represent a boy with no older siblings, considerable

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[1] The relevant household productive activities and types of contributions from children change as children age. The relevant components for each age interval can be determined by pre-testing.

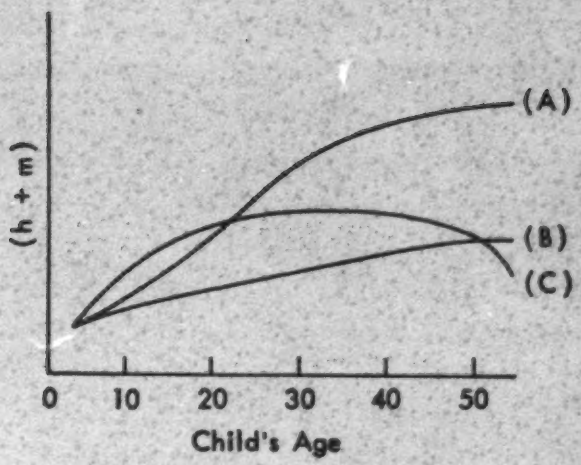

Fig. 1—Illustrative life-cycle patterns of child economic value

family land, etc.; Curve B a boy with many older siblings, little family land, etc.; and Curve C a girl with no older siblings, little family land, etc. It should be emphasized that Fig. 1 is only illustrative; finding the shapes of the curve for various categories of children in particular populations may be an intermediate research step for some purposes or an object of interest in its own right.[1]

These predictive equations should also be useful when time or money resources are inadequate to support the data collection effort necessary to compute measures of child economic value for all members of a sample population. Obtaining information on time uses, amount of production, or children's marginal productivity, for example, may be costly. It may often be sufficient to gather such expensive data for

[1]Lorimer (1967) simulates relationships among fertility, mortality, consumption trends, and production potentials in less developed countries. Because of the absence of information of the type illustrated in Fig. 1, however, his results appear to be based on rather arbitrary assumptions about the age-specific and sex-specific relative productivities of rural people.

only a subset of the full sample and to estimate regression equations that can be used to predict child economic value for those for whom the necessary data was *not* collected. The predictions for the latter group are made on the basis of information collected for *all* members of the sample--information that is cheap to obtain but is thought to influence child economic value. Examples of such explanatory variables include a child's age, sex, and school level, and his parents' wealth and land holdings.

More sophisticated strategies of overlapping samples might also be used, with different components of child value surveyed in different subsamples, but with estimated measures of child value computed for all sample units.

2. Measures of Expected Child Value

The economic value parents *expect* from a young child or an unborn child may influence their childbearing and child care behavior more than the actual measured value of their own children or other children in the community. If, indeed, it is parental *attitudes or expectations* about child economic value, rather than *actual* child economic value, that is believed to be an important explanatory variable in certain phenomena, or if expected and actual child economic value are thought to be highly correlated, why should a researcher pursue difficult information about patterns of time use, prices, wages, and so forth instead of simply concentrating on efforts to elicit subjects' expressed attitudes and expectations? There are at least four reasons. First, if the research goal is to estimate child economic value as a component of family income or wealth in a study of the determination or distribution of these variables, objective measures are clearly more appropriate than measures of attitudes and expectations.

Second, if expected child value *is* a quantitatively important factor, researchers and program evaluators should know what variables influence expected child value. The indirect effects of locational factors, prices, availabilities of modern productive inputs, schooling, market substitutes for the children's time, and so forth on household behavior cannot be identified without information concerning the dependence of child value on these factors. In other words, identification

of the influence of parents' expectations about child economic value on an important outcome such as early child nutrition does not by itself facilitate predictions of variations or changes in nutritional status under different economic or public policy regimes. One must also know how these regimes originally affected parents' expectations about child value.

A third reason for being interested in objective characteristics of persons and situations that affect the economic value of children is that these objective characteristics may influence behavior without an easily surveyed intermediate effect on persons' perceptions and expressed expectations. For example, some poor traditional farmers may say they adopted a new seed variety or shifted their land to another crop because a neighbor who "always seems to do the right thing" did. Other farmers may give their reason in terms of a new seed given them by another farmer whose harvest they helped with. Only a few farmers might respond to the survey question in terms of a reduction in the price of the new seed or a change in the relative price of crops. Yet, the changes in relative prices may have induced the large or successful farmers' adoption, and thus been the necessary condition for all the other changes, regardless of a person's responses about the *proximate* causes for his behavior. The same processes might underlie parents' responses to questions about why they do or do not send their children to school or give their children better food.

Fourth, though evidence is lacking on the point, objective measures may be preferred because of their presumed greater stability and survey reliability.

One promising research strategy is to relate both objective and subjective measures of child value to the behavior of interest and investigate their relative explanatory power. Each type of measure has its advantages,[1] but the use of each should be guided by theoretical considerations.

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[1] Mueller, 1972, pp. 388-389, argues for the usefulness of attitudinal and expectational data in studying the costs and benefits of children.

3. Predictive Power of Components of Child Economic Value

There is almost no evidence about the manner in which parents' expectations about the value of their children depend on objective factors, and only scant evidence about how parents' fertility and child care behavior is influenced by either objective factors or expectations. A natural research strategy in this circumstance would be to avoid imposing an *a priori* functional form, such as Eq. (1), on the specification of child value. Instead, one might separately enter each of the objective factors that theoretical considerations suggest determine child economic value into a regression. These factors include family income, prices of family-produced products, and prices of substitutes and complements for children in household production.[1] The regression's dependent variable would be the behavior or interest--for example, a fertility, schooling, or savings variable. Eliminating explanatory variables with insignificant coefficient estimates or estimates contrary to hypothesis would leave a set of regression coefficients that can be interpreted as weights corresponding to the particular variables. These weights could then be used in aggregating the explanatory variables into a single measure. Unless having a single measure of child economic value was of interest, however, the only reason for carrying out this final aggregation would be to reduce the number of variables and thereby preserve statistical degrees of freedom for subsequent regressions. Apart from these considerations, researchers would probably be satisfied with estimates of the set of individual weights.[2]

The choice of variable to include in the regressions should depend on the same considerations discussed in Section III. No matter how the

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[1]Except for income, these variables are likely exogenous to short term family behavior. Hence, the resulting regression is close to a reduced form. In the longer run, all these factors become endogenous to some extent, since families may move to areas where relative price patterns are favorable to their talents and proclivities for household production.

[2]A related approach would predict the behavior without including variables pertaining to child value. Regressing the residuals from this regression on the child value variables would then test their explanatory power.

factors interact, economic considerations point to a particular set of factors as potentially important.

4. Biases in Partial Measures of Child Economic Value

Whatever assumptions are made about expectations formation and the other issues discussed in this subsection, estimation biases may be expected if the effect of one component of child economic value is investigated without considering the partial effects of the most important other influences. To illustrate the existence of these biases, we consider a single example. Assume that the total amount of time a child spends doing a group of household activities is to be used as a proxy for his economic worth over his parents' lifetime. There are three major conceptual problems with this proxy. The first is that time spent may depend on the child's current age, so that the time variables for children of different ages are not comparable. To account for this, the variable may be corrected for age, as discussed above. Without such a correction, families with children between, say, 10 and 15 will appear to have unusually valuable children. If these families also share a particular set of socioeconomic characteristics, these characteristics will be wrongly associated with high child value.

The second problem is that some children may be of value to their parents apart from their work in the home, and this other source of value may be more important when the child is grown and contributing time or money to his parents. Omitting this other source of child value can cause a statistical association between the child's current time use and some household characteristic (say, the schooling level of parents) to be a biased measure of the true association between *child economic value* and this characteristic. For example, if households in which children work a great deal in the home also tend to receive large contributions from their children later in life, the correlation between *child time input* and schooling level of parents will understate the true correlation between *child economic value* and parental schooling level. If the two components of child value are negatively correlated in the sample, the result is the opposite.

The third problem is that time input is generally a biased measure even of current child economic value in the parents' household (h). In each of the four measures of h in Table 1 that include child time input, other factors also enter. The direction of bias that results from excluding these factors is not determined *a priori*, but it may be substantial.

SURVEY STRATEGIES

The four considerations listed at the beginning of this section also have implications for the design of surveys intended to elicit information on child economic value. These are only very general guidelines, however; most operational judgments depend critically on characteristics of particular research and survey projects and of the population sampled.

For example, the measures of h that include a proxy for children's shadow wage rate (measures 1, 7, and 8 in Table 1) should be more successful in localities where many children do paid work sometime during the year than in communities where children rarely work for pay. Similarly, activities producing output that is frequently bought and sold locally will be well-represented by measures 2, 4, 6, 10, and 11, all of which make use of the price of output. Activities that are commonly done by both children and adults might be best represented by measures 3 through 12, which require relative input, output, and productivity measures. In addition, for activities that the researcher feels might yield substantial noneconomic benefits to parents, it is important to make exclusive use of either measures that reflect only economic returns (measures 2, 4, 6, 10, 11, 12) or measures that capture total returns (measures 1, 3, 5, 7, 8, 9) for all families in the sample. Otherwise, the measures will not be measuring the same conceptual variable in every household.

If resources are small for the part of a survey concerned with child economic value, subsamples can be used for estimating predictive

equations that subsequently generate estimates of child economic value for the sample as a whole. This procedure is discussed above.[1]

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[1]As a related consideration, if the research goal is estimation of the effects of community-level factors on a measure of child economic value or directly on some aspect of family behavior (for example, fertility), then the measurement of these community goods and services and the prices of substitutes and complements for children's services in household production are important and fairly easy to obtain in most survey settings.

APPENDIX

A GENERAL ECONOMIC FRAMEWORK FOR THE VALUE TO PARENTS OF A CHILD'S HOUSEHOLD ACTIVITIES

A family's demand for a child's time to be used in a particular household productive activity depends in general on the production function according to which the child's time and other inputs combine to make the activity's output, the price or marginal value of the output, and characteristics of the supply of the other inputs. The resulting demand is a schedule of the contribution to output of each increment of child's time when all other inputs are adjusted optimally. This demand function is represented as DD in Fig. 2. It slopes downward as long as the family does not have easy access to any perfect substitutes for the child's time.

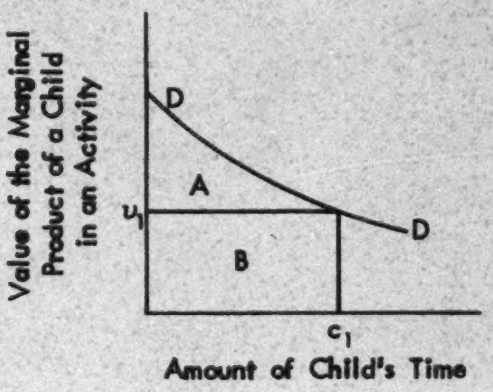

Fig. 2 — Representation of a child's economic value in a household activity

The total value to the household of having the child participate in this activity is the amount of production that would be lost if the child were not in the household: the sum of the child's marginal contributions when the amounts of all other inputs are adjusted optimally at all output levels. In Fig. 2 this equals area A plus area B; together, these are the areas under the demand curve DD between zero hours of the child's time and c_1, the number of hours the child actually contributes to the activity. Rectangle B represents the child's share of

p. 38 blank

production, his marginal value product, v_1, times the amount of time he contributes. If the child were paid a wage, his earnings would be represented by the area of this rectangle. Area A is his parents' producer's surplus, the value of the child's contribution to production over and above the amount he would be paid in a competitive market. If the child were to disappear permanently, his parents would lose a value of product in this activity represented by areas A plus B.

The measures of child economic value that we develop in this report capture only that part of the value represented by rectangle B. Under general conditions, these measures underrepresent the total value of a child's participation in a household activity. Comparisons of a child's economic value in different activities or of the economic value of different children will be biased to the extent that the ratio of area A to area B in Fig. 2 is not the same in the different activities or for the different children. It is therefore important to discuss the conditions under which our measures are reliable indicators of child economic value.

First, the measures are more reliable indicators the flatter is the DD curve with respect to the horizontal axis in Fig. 2. This demand is flatter or more elastic when the child's time has close substitutes in the production process and when these substitutes are readily available to parents. In this case, area A is small since DD meets the vertical axis not far above v_1. These conditions are more likely to be met if other children, household members, or relatives who can help in the activity are present and if the family has a sufficient period of time in which to make these adjustments.

Second, if the demand for the child's services is inelastic, comparisons among different activities or children may still be reliable if the ratio of area A to area B is similar for the activities or children being compared. This is true if the production processes and availabilities of other inputs are similar. These conditions are more likely to be met in making comparisons within the same family, same community, or even same type of local economy and culture than, for example, in trying to compare children in rural and urban settings.

Even when these conditions are probably not met, it is often still possible to make an accurate guess about the direction of bias in our measures for child economic value by checking the availability of substitutes for children in production and the ease with which parents who do and do not have children manage to get their work done using other resources.

EMPIRICAL MEASURES OF THE VALUE TO PARENTS OF CHILDREN'S HOUSEHOLD ACTIVITIES

With the above assumptions, the value of a child's output during a given time period from a particular economic activity, h, can be viewed as the product of the amount of time the child spends in the activity and the value of a unit of his time to the household. Thus,

$$h = w \cdot c \ , \qquad \text{(Measure 1)}$$

or alternatively

$$h = p \cdot MP \cdot c \ , \qquad \text{(Measure 2)}$$

where w is the price (wage) of the child's time, MP is the value of his marginal product, and c is the amount of his time used.

The remaining measures of h are based on comparisons with other persons of the value of the child's productivity or his contribution to output or the amount of his time input. We present these measures because there may be circumstances, discussed in the text, in which information on the absolute contribution of individual children to household production is unavailable, but information on their relative contribution is obtainable.

To construct these alternative measures of h we use one of the following five variables (Σ_C indicates a summation over all children in the family unit; Σ_A indicates a summation over all adults in the family unit):[1]

[1] For notational convenience, we drop the subscript t throughout the rest of the appendix. We continue, however, to refer to output produced during a given time period.

$$r_{child} \equiv \frac{p \cdot MP_{child} \cdot c}{p \cdot MP_{adult} \cdot a} = \frac{MP_{child} \cdot c}{MP_{adult} \cdot a} = \frac{w_{child} \cdot c}{w_{adult} \cdot a} .$$

$$s_{child} \equiv \frac{p \cdot MP_{child} \cdot c}{p[\sum_{C}(MP_{child} \cdot c) + \sum_{A}(MP_{adult} \cdot a)]}$$

$$= \frac{MP_{child} \cdot c}{\sum_{C}(MP_{child} \cdot c) + \sum_{A}(MP_{adult} \cdot a)} .$$

$$u \equiv \frac{p \cdot MP_{child}}{p \cdot MP_{adult}} = \frac{MP_{child}}{MP_{adult}} = \frac{w_{child}}{w_{adult}} .$$

$$v \equiv \frac{c}{a} .$$

$$x \equiv \frac{c}{\sum_{C} c + \sum_{A} a} .$$

The variable r_{child} is the child's contribution to the output of y relative to that of an adult; s_{child} is the child's contribution to the output of y relative to the contribution of all family members combined; u is the child's marginal productivity relative to that of an adult; v is the child's time input to the activity relative to an adult; and x is the child's time input relative to that of all family members combined. Although obtaining data on r_{child} and s_{child} would require somewhat different survey questions, it is useful to note that since

$$r_{child} = \frac{s_{child}}{s_{adult}} ,$$

information on s_{child} and s_{adult} can be used to calculate r.

The five variables r, s, u, v and x can be used along with the variables defined earlier to derive the following additional measures of h:

$$h = r_{child} \cdot w_{adult} \cdot a \qquad \text{(Measure 3)}$$

$$h = r_{child} \cdot p \cdot MP_{adult} \cdot a \qquad \text{(Measure 4)}$$

$$h = \frac{s_{child}}{s_{adult}} \cdot w_{adult} \cdot a \qquad \text{(Measure 5)}$$

$$h = \frac{s_{child}}{s_{adult}} \cdot p \cdot MP_{adult} \cdot a \qquad \text{(Measure 6)}$$

$$h = v \cdot a \cdot w_{child} \qquad \text{(Measure 7)}$$

$$h = x \cdot (\underset{C}{\Sigma} c + \underset{A}{\Sigma} a) \cdot w_{child} \qquad \text{(Measure 8)}$$

$$h = u \cdot w_{adult} \cdot c \qquad \text{(Measure 9)}$$

$$h = u \cdot p \cdot MP_{adult} \cdot c \qquad \text{(Measure 10)}$$

One advantage of these measures of h over the two presented earlier is that they allow use of direct information about the shadow wages, marginal products, or time inputs of adults rather than of children. As we point out in the text, it is likely that such data are often more easily obtained on adults than on children.

In less developed countries, there are probably a number of household economic activities where the contribution of nonlabor inputs is negligible. If in such cases there are also little economies or diseconomies of scale, the value of a household's total output from the

activity, $p \cdot y$, will approximate the value of its total labor input. That is:

$$p \cdot y \approx p[\underset{C}{\Sigma}(MP_{child} \cdot c) + \underset{A}{\Sigma}(MP_{adult} \cdot a)]$$

and

$$s_{child} \approx \frac{p \cdot MP_{child} \cdot c}{p \cdot y} \equiv \frac{p \cdot MP_{child} \cdot c}{H} .$$

These relations allow us to derive two more measures of h:

$$h \approx s_{child} \cdot y \cdot p \qquad \text{(Measure 11)}$$

and

$$h \approx s_{child} \cdot H \qquad \text{(Measure 12)}$$

The reader is cautioned, however, that if nonlabor inputs make any contribution to output, these measures will overstate the value of h because

$$s_{child} = \frac{MP_{child} \cdot c}{\underset{C}{\Sigma}(MP_{child} \cdot c) + \underset{A}{\Sigma}(MP_{adult} \cdot a)} > \frac{MP_{child} \cdot c}{y} .$$

Hence, measures 11 and 12 are appropriate approximations of h only when the contribution of nonlabor inputs to outputs is very small. Very primitive agriculture on squatter's land might be one example.

So far, we have considered a child's value to a household from his participation in only a single economic activity. To calculate a child's total value to a family from household economic activities, we must sum across these activities. It is useful to note that since shadow wages do not vary among activities, they can be placed to the left of the summation sign. In other words, if the magnitude of an

individual's shadow wage in any one activity can be obtained, it can be used for estimating his value in all activities.

The ease with which one can sum across household economic activities will partially depend on the extent to which the various measures of h are equivalent. Such equivalence allows one to select a measure for given household economic activities on the basis of which of the underlying variables are most readily available, rather than constraining one to use the same measure for every activity. One factor that influences the degree of equivalence in alternative measures of h is the importance of the affective and investment components relative to the economic component in the value to parents of child household production. This topic is examined below.

NONEQUIVALENCE OF THE MEASURES WHEN CHILD WORK HAS NONECONOMIC RETURNS

When the conduct or output of a child's household activity enters directly into his parents' utility function--that is, when there is a return to parents from their child's participation in household production over and above he economic return--some of the measures of h capture the economic *and* noneconomic returns, while others capture only the economic returns. Figure 3 illustrates this. Both curves in the figure indicate relationships between the amount of child time spent in an activity and the value of the marginal product of the child's time. The curves are declining in accordance with the assumption made above. The marginal productivity schedule underlying both curves is the same. The difference is the valuation parents place on the product of that activity. The lower curve, labe'ed MP·p, assumes that parents value a product produced by their child at the product's market price. The higher curve assumes that parents place additional value on the product, represented here by π per unit of product.

When a child's household production is valued for purely economic reasons, an empirical measure corresponding to point h_1 would capture the total value of the child's participation in the activity. This value is represented by the area in the rectangle $OV_1h_1c_1$. In this case, all twelve measures of h correspond to the area of this rectangle and are consequently equivalent.

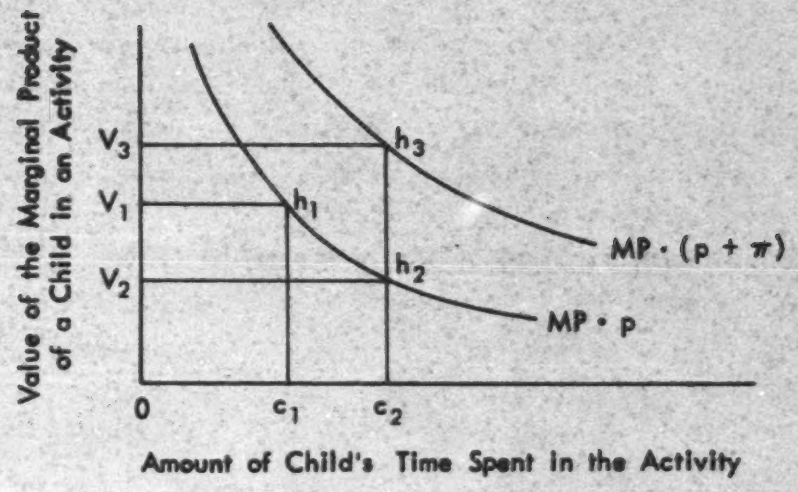

Fig. 3—Comparison of economic and noneconomic returns from child work

If parents value a child's participation in an activity for noneconomic as well as for economic reasons, they would, of course, allocate more of the child's time to the activity than if his participation was only economically valued. Hence, $c_2 > c_1$. In this case the economic returns from the activity would correspond to the area of the rectangle $OV_2h_2c_2$. However, only the measures of h that depend on the market price of outputs--measures 2, 4, 6, 10, 11, and 12--capture *just* the economic returns. The measures that make use of a shadow wage rate--1, 3, 5, 7, 8, and 9--capture the total returns, noneconomic as well as economic. These total returns are represented by the area of the rectangle $OV_3h_3c_2$.

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